MONTAGE

NEWS FROM THE CAMPUSES OF MONASH UNIVERSITY

Volume 2 Issue 3 April 1991

RESEARCH MONASH

LIFTOUT INSIDE

INSIDE RESEARCH

- Mixing the interferon cocktail
- Tracing marsupial ancestry
- Riddle of the polar dinosaurs

Picture: BRIAN CARR

The cars that ate Clayton?

Each day about 7000 cars travel to the Clayton campus – most carry only a driver.

This view of the car park on a corner of Wellington Road and Princes Highway shows a sea of cars.

The university is encouraging staff and students to share cars, and use public transport and bicycles to ease the congestion.

See story page 5.

New interferon therapy could combat cancer and viruses

A new approach to interferon therapy being developed at Monash University could lead to new treatments for chronic hepatitis-B and the deadly skin cancer, melanoma.

The research has offered new hope that interferons – medical science's failed "magic bullets" of last decade – may yet prove to be potent weapons against virus diseases and cancers.

Experiments by Professor Anthony Linnane's research group at the Centre for Molecular Biology and Medicine have produced evidence for a new theory that interferons work in teams to protect cells against virus infections.

The theory is that people who contract chronic viral infections like hepatitis-B have defective interferon systems – they may have suffered a mutation to one or more of their interferon genes.

Professor Linnane's team also has shown that particular combinations of interferons rapidly kill melanoma cells under test-tube conditions.

He believes his team's results explain why the spectacular test-tube performance of interferons failed to translate into effective clinical therapies for chronic hepatitis-B infections during the past decade.

"Interferons worked brilliantly in the laboratory," he said. "If you put human cells in with interferon in a test-tube and challenged them with a virus, they were absolutely protected against infection. But the clinical trials were disappointing."

In the wake of recent clinical trials overseas in which interferons have proved effective in treating hairy-cell leukaemia and Kaposi's sarcoma, the Monash team has shown that specific combinations of interferons cause human melanoma cells to self-destruct under test-tube conditions.

Professor Linnane believes the original interferon revolution failed because researchers were unaware of the diversity of interferons produced in human cells.

He says hepatitis-B trials of the 1980s had used single, pure interferons produced from cloned human genes. Most patients had shown no response, but a small minority had shown positive benefit, and some had even been cured.

Researchers had tended to dismiss such responders as cases of spontaneous remission, but Professor Linnane now believes they responded because they were lucky enough to receive an interferon that their own bodies had failed to produce.

Because the majority of patients were lacking in other, different interferons, they had shown no response.

A person missing any one of the interferons that normally protect cells against the hepatitis-B virus would be vulnerable to chronic infection. Therapies would have to be tailored to remedy the specific interferon defect that had allowed the virus to establish a chronic infection.

Professor Anthony Linnane.

The Monash team has recently begun experiments to see if interferons can be used to treat the dangerous form of skin cancer, melanoma. Australia has the highest incidence of melanoma in the world.

The researchers have been grafting human melanoma cells into laboratory mice, to test whether interferon cocktails that work under test-tube conditions will also work in living animals, and eventually in humans. Early results had proved promising, Professor Linnane said.

(The full story on the research team's work is in this issue's Research Monash.*)*

INSIDE

AROUND THE CAMPI

CLAYTON

Second year mathematics student Mark Kisin figured prominently in a recent mathematics competition held in Sydney.

In the Sydney University Mathematical Society (SUMS) competition, open to undergraduates at all levels, Mr Kisin submitted the best first year entry, as well as the best overall solutions to two of the 10 problems set.

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Ms Maria Galanis, a PhD student in the Department of Biochemistry, has won an inaugural Promega student award.

She was one of three postgraduate students from around Australia whose work in molecular biology was recognised at the 13th Annual Conference on the Organisation and Expression of the Genome, held at Lorne last month.

The award recognised her study of the transport of proteins across biological membranes, as part of a research team in the Biochemistry department and the Centre for Molecular Biology and Medicine, led by Professor Phillip Nagley and Dr Rodney Devenish.

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The Queenscliff Marine Station – a joint research centre involving Monash University, RMIT, the University of Melbourne, and the Victorian Institute of Marine Sciences (VIMS) – was opened recently by the Minister for Conservation and Environment, Mr Steve Crabb.

The $500,000 station will undertake research into oil spill control, coastal resource management, environmental toxicology and aquaculture. It also will provide teaching facilities including a laboratory, field boat and salt-water aquarium for the three higher education institutions.

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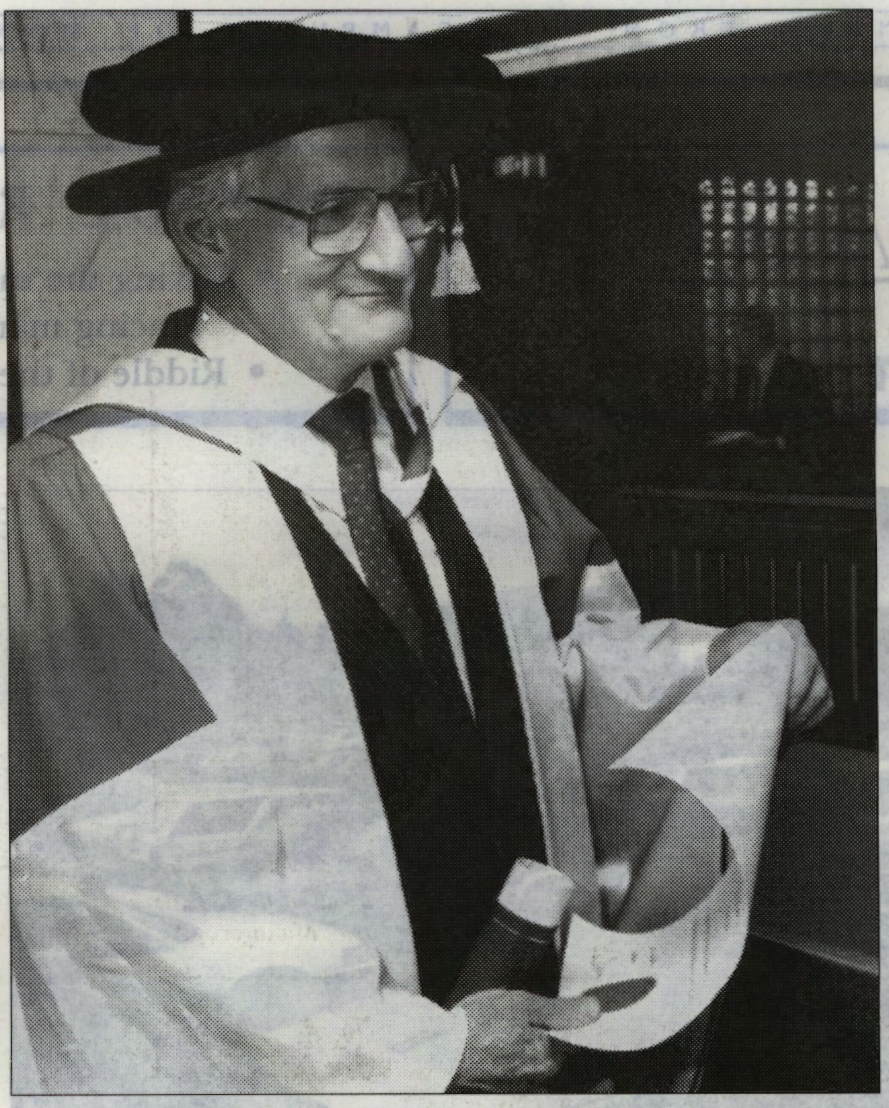

Well-known Australian banker, Mr Will Bailey, received an honorary degree of Doctor of Laws at the Science/Medicine graduation ceremony last month.

Mr Bailey is chief executive and deputy chairman of the ANZ Group. He joined the Group in 1950, and was appointed Chief Manager – International, London, in 1977.

Since 1983, Mr Bailey's directorships have included the Australia and New Zealand Banking Group Ltd, ANZ Banking Group (New Zealand) Ltd, ANZ Grindlays Bank, Esanda Finance Corporation Ltd, Dalgety Farmers Ltd, and Coles Myer Ltd. He took up his present appointment in 1988.

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A random data expert from the US, Dr Julius Bendat, recently conducted an intensive short course on nonlinear system analysis and identification from random data.

The course, organised by senior lecturer in mechanical engineering, Dr Len Koss, attracted participants from industry, government and academia. Dr Bendat, author of several textbooks on random process theory, is a private consultant in the US.

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Professor Marcia Neave, one of Australia's leading law reformers, is the first scholar to be appointed to a personal chair in the Monash Faculty of Law.

She is known internationally as an expert in property trusts and family law, and has written several major reports arising from her work for law reform agencies and governments.

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Associate Professor Robert Brown has been appointed to the National Australia Bank Chair in Finance.

He joined Monash as a lecturer in 1979 and was appointed associate professor in 1986.

His research interests include security market behaviour and the financial aspects of land and housing markets.

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CAULFIELD

The Department of Asian Languages and Studies recently has appointed three senior academics. Pictured (from left) are Dr Christopher Court, Professor J. Bruce Jacobs and Professor Stuart Robson.

Dr Court will head the department's Thai language program. Professor Jacobs, the department's new chairman, is a specialist in Chinese politics and society. Professor Robson will head the Indonesian language program.

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Dr Lawrence Austin, of the Department of Biochemistry, is to be presented with an award by the Australian Neuroscience Society.

The first medal of the Society for Outstanding Contributions to Neuroscience in Australia will be awarded to Dr Austin for his achievements in founding the society in 1972 and research into neuroscience.

Dr Austin has been involved in this field since he joined Monash in 1962. His research has ranged from the regeneration of peripheral nerves to, more recently, muscle disease, focusing on muscular dystrophy in particular.

He is currently researching the effects of growth factors on muscles.

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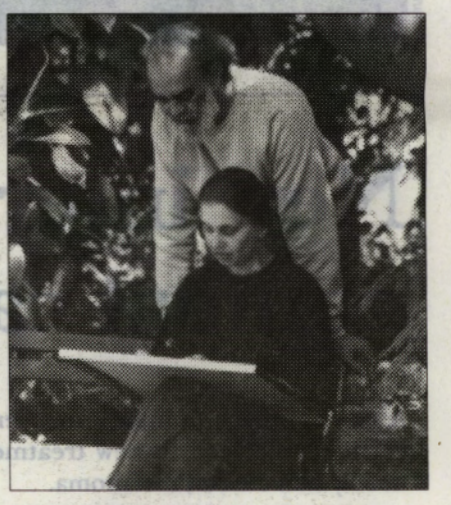

Senior lecturer in fine art, Mr Bernard Hoffert, last month opened an exhibition at the Highway Gallery, Mount Waverley, of works by two Sri Lankan artists.

The exhibition was by Neville Weereratne and his wife Sybil Keyt, pictured above in the garden of their Glenhuntly home.

Both artists are well known in their home country, and this was their first Australian exhibition.

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MONTAGE

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At the launch last month of the medical services agreement for people with intellectual disabilities were (pictured at right, from left) the Chairman of the Department of Community Medicine, Professor Neil Carson; the Deputy Dean of the Faculty of Medicine, Professor Dennis Lowther; the Minister for Community Services, Ms Kay Setches and the immediate past president of the AMA's Victorian branch, Dr Richard Whiting.

Under the agreement, worth about $750,000 over three years, a specialised health unit for the intellectually disabled will be set up at the Moorabbin branch of Monash's Department of Community Medicine.

Aerospace research centre aims high

Monash University will provide expertise in materials engineering to the new Cooperative Research Centre in Aerospace Studies.

The centre is one of 15 announced last month by the Federal government. Their aim is to provide a base for Australia's future industrial structure, and to strengthen links between universities, the CSIRO and industry.

The centres cover areas including high-tech manufacturing systems, plant science, waste management, environment protection, metallurgy, telecommunications and medical technologies.

Monash's Centre for Advanced Materials Technology (CAMT) was part of a consortium of four universities, a laboratory and two airframe companies which put together the proposal for the aerospace studies centre.

The major participants are Aerospace Technologies of Australia, Hawker de Havilland, the Royal Melbourne Institute of Technology, the University of Sydney, the University of New South Wales, and the aeronautical research laboratory of the Defence Science and Technology Organisation.

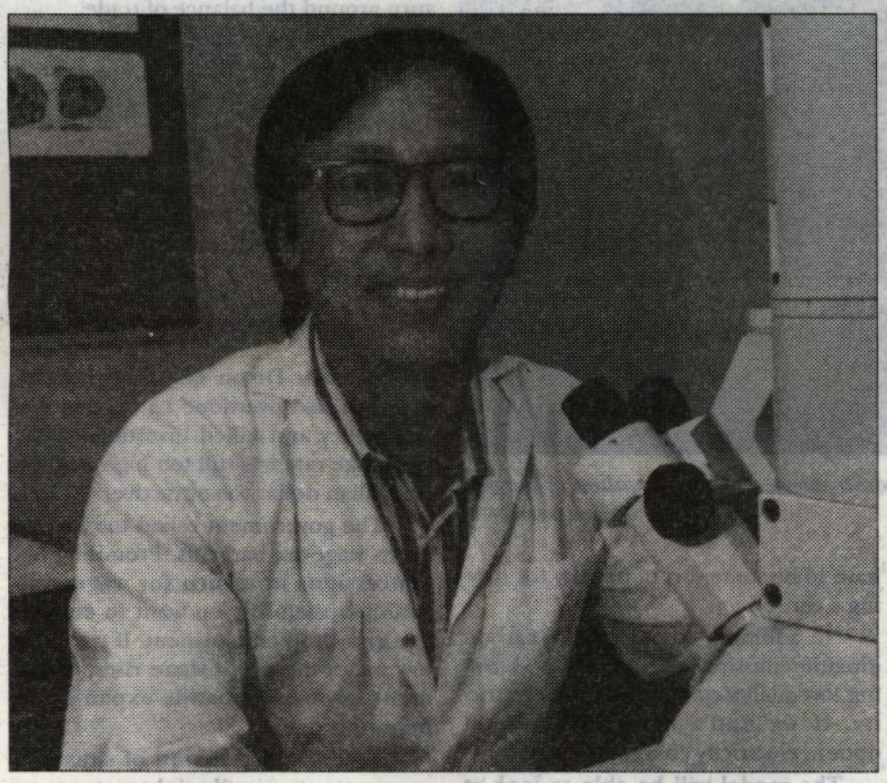
The centre aims to develop new technologies for the manufacture of value-added aerospace components. Its initial research program will concentrate on structures which employ advance fibre-reinforced composite construction.

CAMT will be involved in developing advanced structures and composite manufacturing, particularly in the use of fibre optic sensors for process control and "smart" materials research.

The centre's manager, Mr Don Jaffrey, said at least four full-time research workers and supporting staff would be working at Monash. He expected the university would receive between $3 million and $4 million over five to seven years for its part in the centre's research.

"The centre will create a sharp increase in the export capability of Australian industry, enabling it to achieve a more competitive position in the rapidly-growing world civil aerospace market," he said.

Head of the Department of Materials Engineering, Professor Paul Rossiter (left), with Manager of the Centre for Advanced Materials Technology, Dr Don Jaffrey.



Dr Zhong Xiong Wang.

Medical researcher passes his first test

Monash University research officer, Dr Zhong Xiong Wang has become the first Chinese-trained medical doctor to pass the Australian Medical Council examination.

A spokesperson for the council in Canberra said that from 1978 to 1990, 12 doctors trained in China had sat the examination, but none had passed.

For doctors trained abroad, the multiple choice examination is the first step in becoming a licensed medical practitioner in Australia. The second step is a clinical test.

Dr Wang graduated from the Shanghai Second Medical College in 1968. He studied western medicine, as well as the rudiments of traditional Chinese medicine, including herbal therapy and acupuncture.

"Competition for entry into all tertiary programs in China is very fierce, and even worse for medical students," Dr Wang said.

He said only one per cent of secondary school graduates in China continued studying at a tertiary level, and only students with the highest marks were permitted to study medicine. Dr Wang was among a class of 400 students in his year.

Since migrating to Australia five years ago, Dr Wang has worked for the Centre for Molecular Biology and Medicine. He is researching the causes of ageing with the director of the centre, Professor Anthony Linnane.

He intends to complete the clinical examination next year, and plans to pursue a career in medical research.

Dr Wang is an andrologist, which he describes as the equivalent of a gynaecologist for males. He hopes eventually to return to his research work on male infertility.

Master plan for Caulfield unveiled

Cinemas, restaurants, sporting facilities and shops are just some of the features of a master plan unveiled last month for the Caulfield campus.

The five-year plan, which will include the construction of a multi-million dollar tower building on Dandenong Road, next to the Caulfield Plaza Shopping Centre, not only will provide for the needs of students, but also will encourage broader community use.

The Vice-Chancellor, Professor Mal Logan, said the master plan represented an exciting development for both the university and the community. "The plan underlines the importance of Caulfield campus as an integral part of Monash," he said.

"The tower building will be designed to be a significant feature, clearly identifying the university by giving a prominent 'front door' to the campus."

The building also will house the university's David Syme Faculty of Business and the Graduate School of Management. Professor Logan said enrolments at the campus were expected to grow over the next few years, particularly in the computing and information technology and business faculties.

The master plan was created to fulfil conditions of a previous town planning permit and to alleviate space problems and inadequate student facilities. Professor Logan said that specific measures had been taken to increase student parking areas and reduce demand for parking.

The plan was prepared by consultants under the guidance of a combined council and university working group.

The Mayor of Caulfield, Councillor Geoff Patience, said that public comment would be sought before the council considered the plan. The plan may be inspected at the city hall's planning section, or at the university's Commercial Property Office, level four, Chisholm Tower, 26 Railway Avenue, Caulfield East.

For further information, contact Mr Jeff Akehurst, Town Planner, Caulfield City Council, on 524 3333, or Mr Peter Cunliffe, Commercial Property Manager, Monash University, on 73 2111.

Business newspaper launched

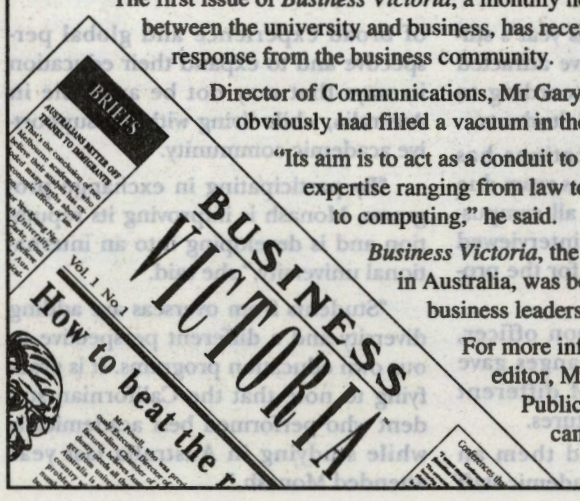
The first issue of *Business Victoria*, a monthly newspaper promoting links between the university and business, has received an overwhelming response from the business community.

Director of Communications, Mr Gary Neat, said the newspaper obviously had filled a vacuum in the information market.

"Its aim is to act as a conduit to business of Monash expertise ranging from law to science, and economics to computing," he said.

Business Victoria, the first publication of its type in Australia, was being mailed direct to senior business leaders and opinion makers.

For more information, contact the editor, Ms Susanne Hatherley, Public Affairs Office, Clayton campus, extn 75 3087.



Economic model is one out of the box


Economics experts to switch universities

By THE COLUMNIST

The director and almost half the staff of Melbourne University's Institute of Applied Economic and Social Research are expected to leave for Monash University.

Professor Peter Dixon, of a rival body, the National Institute of Economic Research. The executive deputy director, Dr Frances Ironmonger, resigned 3 years later.

The issues then were economic models p

From The Age, *3 July 1991.*

Professor Peter Dixon hasn't stopped to unpack his boxes since returning to Monash last month to head the Centre of Policy Studies.

Instead, he and his team already have started work on a revised economic model of the Australian economy, building on his work as director of Melbourne University's Institute of Applied Economic and Social Research for the past seven years.

Professor Peter Dixon, a former Monash honours student, has brought with him many key staff and expects the core of the research team, which developed the widely-used Orani model, to follow.

The model, a system of equations describing relationships between economic variables, is used by economists to predict the impact of development or policy changes.

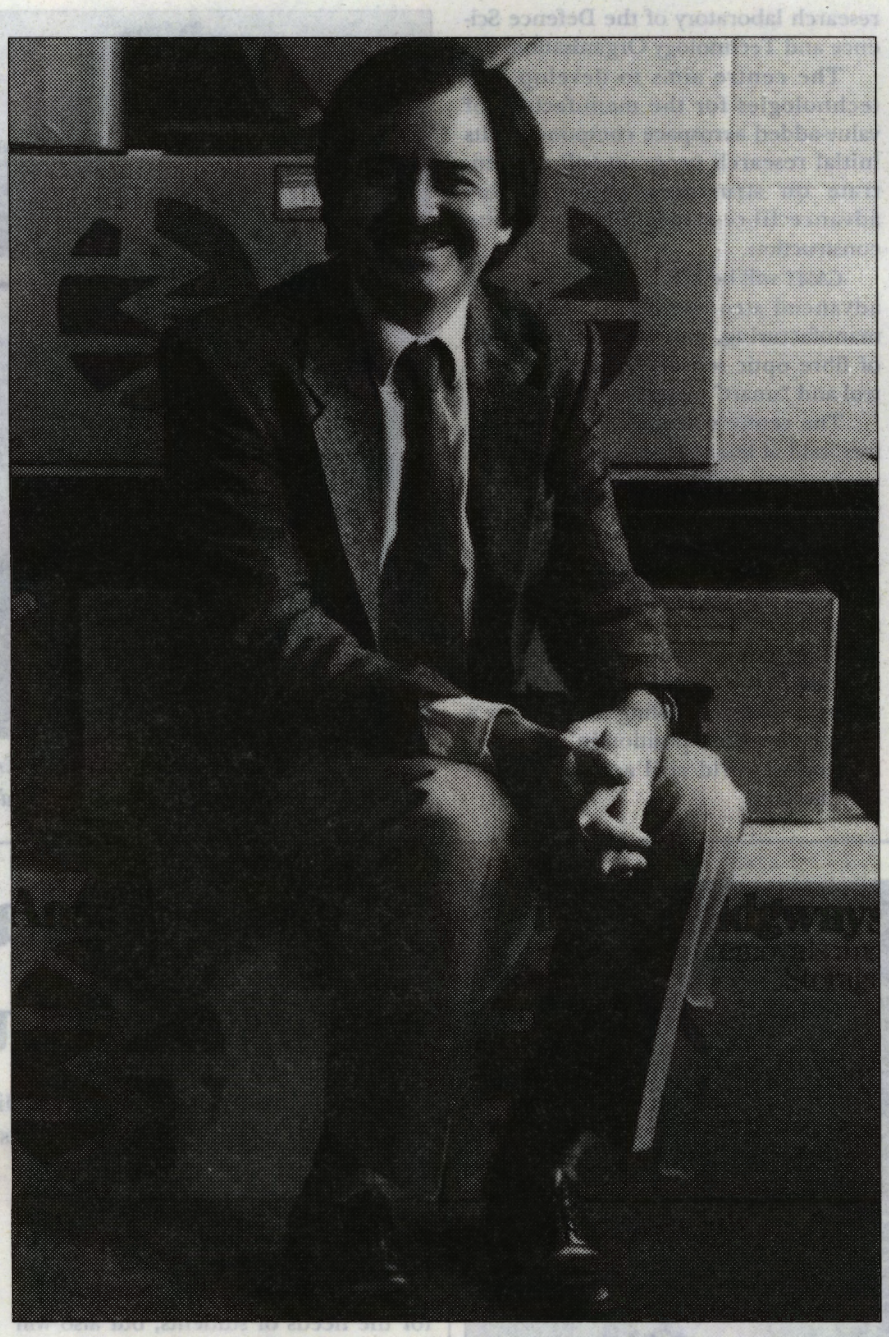
Elaborate

Orani, named for Professor Dixon's wife, is used by the Industry Commission. The new model developed by the centre will be known as Monash.

"Even the most elaborate model is a simplification of the real world. It is a never-ending task to add more realism. The areas in which people are interested constantly change," Professor Dixon said.

Professor Dixon's team is planning five improvements for the model. These include the impact of changes in technology, the environmental effects of changes in production, and the economic effects of environmental changes.

The new model also will be a dynamic model of the economy, rather than a static one, capable of building in the cumulative effects of changes.



Professor Peter Dixon: "Even the most elaborate model is a simplification of the real world".
Picture: BRIAN CARR

It will automatically incorporate the latest national accounts data and assess the effects of future changes on State Government finances.

Impact

Professor Dixon said the new model would be able to assess the impact of the Toronto conference, which called for a 20 per cent reduction of greenhouse gases by 2005.

"What will happen if we achieve this target?" he continued.

"I'd guess that electricity and transportation will be more expensive. If we are to reduce exhaust fumes, there will have to be some sort of penalty for driving a car.

"In addition, 40 per cent of carbon dioxide emissions are created by burning low quality coal to generate electricity. If we don't have this low-cost option, electricity charges will rise."

The model will be able to look at the causes of technological change.

"Is it related to investment activity or research and development? Are we merely copying other countries? What is the role of patents?" he asked.

Professor Dixon hopes the new Monash model will ready to produce results by 1993.

In the meantime, based on his own observations, he is confident that foreign debt will stabilise by the next decade. He said this was inevitable simply because "the foreigners won't lend us any more money".

Debt

"At present, we have a current account deficit of $18 billion a year," he said. "Exports will have to grow considerably if we are to pay the interest bill on our accumulated debt.

"This has to happen and it will happen. In fact, we should stop worrying about the debt problem because the situation will remedy itself.

"Ideally, exports should be two per cent greater of GDP than imports. At the moment, they lag behind imports by about two per cent. Over the next few years, we will see a rapid rise in exports.

"This is good news for anyone with export interests such as miners and farmers. The bad news is that there won't be much room for increased local consumption while we're trying to turn around the balance of trade.

"Australia will see a period of fiscal austerity. The government will tighten up expenditure and real wages will be subdued.

"In summary, what we will have is a lower exchange rate, rapid growth of exports, a slow down in imports, constrained expenditure and low real wages."

Overdone

Professor Dixon said that the government had overdone its tight monetary policy and killed investment. The exchange rate was still too high and the Australian dollar too attractive.

"The government relied too heavily on its wage-tax bargains. Promising tax concessions in return for wage constraint is useful if you want to encourage growth in employment. If you have low wages the profit share rises, investment booms, demands expand and imports grow.

"To restrain this kind of situation, governments usually tighten taxes or decrease spending. In Australia's case, the government already was using tax concessions to control wages and didn't have available this traditional fiscal instrument."

A PhD graduate of Harvard, Professor Dixon is one of only 10 Australians listed in *Who's Who in Economics.*

Student exchange demand grows

Information sessions for this year's student exchange program have attracted an impressive response, according to the Centre for International Students.

The number of applications has risen compared with previous years due to the interest shown from all campuses. Applicants will now be interviewed to determine those suitable for the program.

Student exchange liaison officer, Ms Gwen Rowe, said exchanges gave students an experience of different educational systems and cultures.

Such programs offered them an opportunity to work with academic staff of broad experience and global perspective and to expand their education in ways that may not be available in Australia, while living within a supportive academic community.

"By participating in exchange programs, Monash is improving its reputation and is developing into an international university," she said.

"Students from overseas are adding diversity and a different perspective to our own education programs. It is gratifying to note that the Californian student who performed best academically while studying in Australia last year attended Monash."

For almost 10 years, Monash students have taken part in an overseas student exchange agreement with the University of California.

Students spend a year studying in the US and an equal number of American students may come to study at Monash.

Students can choose from eight campuses at California. They complete a course of study which is then credited towards their degrees.

Tuition fees are waived but applicants are responsible for their own travel, accommodation, medical insurance and living expenses.

Ms Rowe believes that both universities benefit from the program.

"The University of California regards the Pacific rim region as their target area," she said.

Monash also has an exchange agreement with the University of Illinois at Urbana-Champaign, and with Yonsei University in Korea, where the program is taught in English.

"Our students are fortunate that Monash academic staff and senior administrators are very supportive of the exchange program," she said.

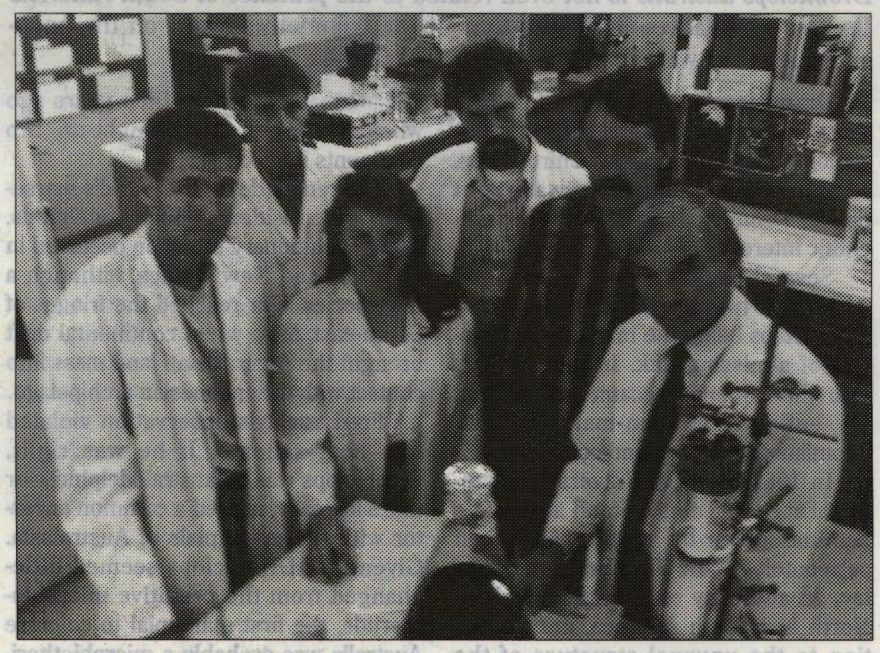
"I am hopeful that the university will expand the program, and find other exchange partners to help satisfy the demand from our students.

"We would like to give the students more choice and variety of cultures."

RESEARCH
MONASH

Mixing the interferon cocktail

Interferons have returned to the fight against cancer and virus diseases. Professor Anthony Linnane's research group believes it knows why interferons did not fulfil their early promise.



Members of the interferon research team at the Centre for Molecular Biology and Medicine (from left), Dr Gary Wayne, research assistants Mr Paul Humphreys and Ms Carmela Losinno, Mr Bruce Wines, Dr Paul Hertzog and Dr Ian McKay.

Interferons are back, and showing every sign of fulfilling the promise that led medical scientists to hail them as "magic bullets" against cancer and virus diseases a decade ago.

Interferons, natural agents that had promised to halt the uncontrolled growth of cancerous cells and to protect cells against virus attack, failed to realise their laboratory promise in clinical trials.

By the early 1980s, most scientists had turned elsewhere in the search for effective therapies for cancer and life-threatening virus diseases like hepatitis-B. They left a field littered with contradictory research results and a conundrum: why did interferons work so well on isolated cells, but so poorly in living individuals?

Professor Anthony Linnane, head of the Monash Centre for Molecular and Cellular Biology, suggests that the answer is that in the human body, interferons do not work as single compounds: they work in teams.

A British research team led by an Australian, Alick Isaacs, discovered interferons in 1957. They showed that fibroblast cells secreted interferon when challenged by viruses, and became resistant to infection.

By the 1970s, scientists had identified three basic types of interferon: alpha, beta and gamma. Each is secreted by specialised cells, although these cells typically produce smaller quantities of the other interferons in addition to their main product. To a greater or lesser degree, each interferon exhibits anti-viral, anti-proliferative (anti-cancer) properties, and regulates the production of antibodies.

During the 1960s and 1970s, when blood cells were the only source of interferons, the total world supply was measured in milligrams, making them prohibitively expensive even for experimental purposes.

Erratic

With the advent of genetic engineering in the early 1980s came new hope that interferons could be produced in the quantities needed for clinical experiments. But when pure interferons were given to people suffering from chronic hepatitis-B infection, the results were erratic and disappointing.

On the basis of these results, Professor Linnane predicted that treatments with single cloned interferons were unlikely to prove consistently successful, and that new interferons still remained to be discovered.

He was right. By 1990, molecular biologists had cloned genes encoding at least a dozen new variants of alpha interferon, in addition to gamma and beta interferon.

What was the purpose of this diversity? Professor Linnane and his colleague Dr Paul Hertzog decided to explore a theory that the multiple forms of interferon had subtly different functions, and that they worked synergistically – that is, different combinations of interferons worked together to produce the anti-viral, anti-cancer and immunoregulatory responses in living organisms.

The implication was that different cancers and viruses responded to specific combinations of interferons, and that some defect in this coordinated response led to the body's failure to deal efficiently with virus diseases.

Taking the idea further, they theorised that different viruses are inhibited by particular combinations of interferons, and that serious viral infections occur in individuals who are unable to produce the full complement of interferons needed to prevent infection.

Professor Linnane says that many people are infected by the hepatitis-B virus at some time in their lives. Most experience a sub-clinical infection with no adverse effects; some suffer severe infection but recover within a few weeks. A small minority of people contract a chronic infection that can lead to severe liver damage (cirrhosis) and even liver cancer.

Defence

The interferon system seems to be the body's first line of defence against virus infections. Any virus breaching this defence is usually dealt with by the immune system, which after a short delay, begins making antibodies to neutralise the virus. But sometimes, both systems fail, resulting in a chronic infection.

It is estimated that worldwide, there are about 200 million chronic hepatitis sufferers. Some of these individuals participated in small-scale clinical trials in the 1980s in which single interferons were administered.

Results were disappointing. A small minority of patients improved – some even recovering completely – but the lack of any consistent pattern of response led researchers to dismiss such results as cases of spontaneous remission.

But Professor Linnane, reviewing these results, took a different view. "A 20 per cent response is very significant. The real question is why the other 80 per cent didn't respond," he said.

The Monash team reasoned that the small number of responders received an interferon that was deficient in their own bodies. That deficiency had permitted the infection to establish itself in the first place.

Patients in the various hepatitis-B trials had been treated with different interferons, yet each time, some 20 per cent had shown a positive response.

The pattern was consistent with the Monash team's idea that the responders, by chance, had received the interferon they were lacking. By extension, the majority of patients had failed to respond because they had different interferon deficiencies.

Such an explanation would fit the classic pattern of a genetic disorder. The affected individual inherits a defective gene; the gene either fails to function, or its encoded the protein is functionally defective.

The Monash group's "interferon cocktail" theory implies that if, for example, a specific combination of three interferons protects cells against a particular virus, a mutation in any one of those three genes would leave cells vulnerable. A successful therapy would then depend on identifying and supplying the missing interferon.

Professor Linnane's team faced problems: pure interferons are either unavailable or are still very expensive. The alpha interferons are also very difficult to tell apart because they tend to cross-react even with highly specific monoclonal antibodies.

Cloned genes

Resourcefully, the Monash team cloned the genes for human alpha-interferons 1, 2, 4, 5 and 14. Splicing these human genes into yeast, they produced enough for their own experimental needs. They also developed a suite of monoclonal antibodies capable of distinguishing between their alpha-interferon variants.

In the past two years, Professor Linnane's team has obtained evidence that its "cocktail" concept is essentially correct, and is optimistic that during the 1990s interferons will begin to fulfil their original clinical promise.

It tested the livers of 32 people who had died of complications arising from chronic hepatitis-B infection, and obtained results that initially made little sense. Areas of liver tissue infected by the virus tested positive for interferons.

"Interferons were being produced at the focus of the infection, but they had failed to protect the liver cells," Professor Linnane said. "Then came the intellectual leap; we realised we were seeing the result of a failure of the interferon system."

It was this result that led Professor Linnane and his team to suspect that each hepatitis-B subject had lacked some vital interferon from the mix that normally would prevent infection.

Professor Linnane's team believes interferon replacement therapy could save the lives of people with chronic hepatitis-B infections. It would depend on identifying which interferons their cells were already making, and supplying any missing components.

"If your body is producing lots of alpha-2 interferon, there's no point giving you alpha-2 interferon," Professor Linnane said. "But if your cells aren't producing it, it's probably just the thing you need."

Defective

Professor Linnane's team hopes to apply gene-probe technology to identify defective interferon genes, so that interferon replacement therapies could be tailored to each individual's needs.

While research is still in its early stages, the first application of the new interferon therapy may be a life-saving treatment for chronic hepatitis-B infection.

Interferons are also showing considerable promise in the treatment of certain cancers such as hairy-cell leukaemia and the AIDS-associated cancer, Kaposi's sarcoma.

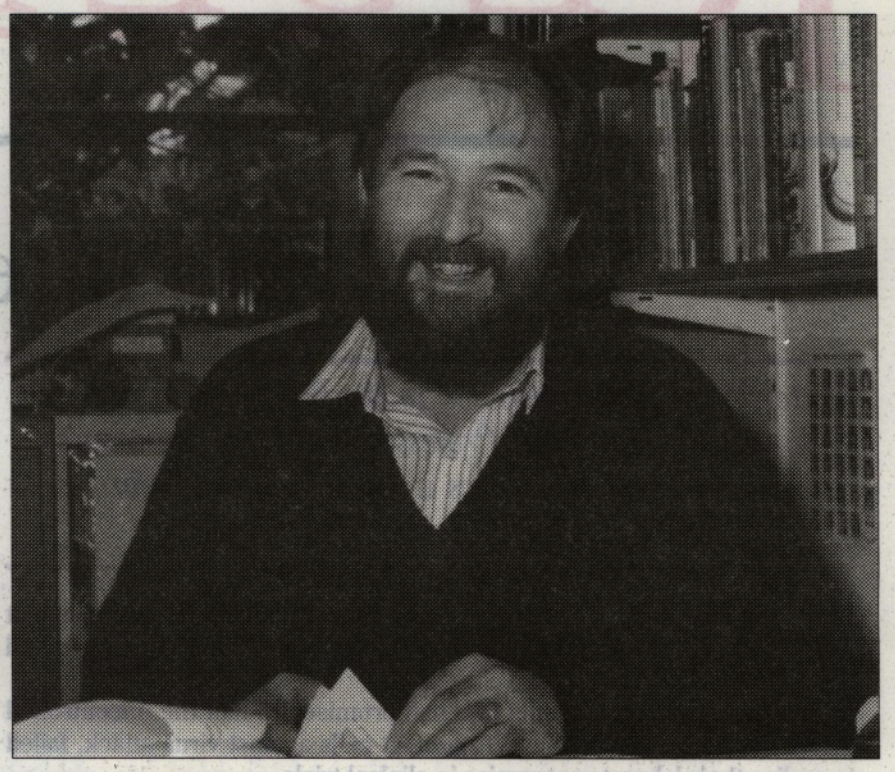
The Monash team has obtained promising early results with melanoma, the most malignant form of skin cancer. Australia, with its combination of a fair-skinned population and high levels of ultraviolet radiation, has the highest incidence of melanoma in the world.

The team established eight human melanoma cell lines in laboratory culture, and variously exposed them to pure interferons, and to various combinations of the same interferons.

Continued on Research Monash 4

Tracing marsupial ancestry

The trail of an elusive rat-sized marsupial has led Dr Peter Temple-Smith to the Chilean rainforests. He has used the physiology of sperm to show that its closest relation is a native of Australia.



Dr Peter Temple-Smith.

The temperate coastal rainforests of Chile are home to a rat-sized mammal that the Chileans call *monito del monte* – "little monkey of the forests". But *Dromiciops australis* is not even related to the primates of South America. Its nearest relatives live more than 13,000 kilometres away, on the opposite side of the world's largest ocean, in Australia.

Dromiciops is a marsupial. In a continent whose marsupial fauna offers zoologists such oddities as Chironectes, an aquatic opossum with a watertight pouch, Dromiciops is of unrivalled scientific interest.

Several lines of evidence emerged in the past two decades that pointed to Dromiciops being the marsupial equivalent of a missing link. In January this year the evidence became compelling, presenting Australian marsupial taxonomists with a profound conundrum.

In 1982 Monash University anatomist Dr Peter Temple-Smith attended a seminar given by visiting American palaeontologist Dr Fred Szalay. Dr Szalay, an authority on the marsupials of North and South America, drew attention to the unusual structure of the tarsal bones in the foot of Dromiciops.

The tarsals of Dromiciops, said Dr Szalay, were unlike those of any other American marsupial, and more closely resembled those of Australia's kangaroos, wallabies and possums.

It was not the first time that Dromiciops had come to scientific attention. In the mid-1950s Argentinian palaeontologist Osvaldo Rieg was studying fossilised skulls of an extinct South American group of primitive marsupials called microbiotheriids.

Comparing the fossilised skulls with those of extant marsupials, Dr Rieg was astonished to find that the skull of Dromiciops was almost identical to that of a microbiotheriid. If he was right, Dromiciops was the sole living representative of a family that had supposedly become extinct 40 million years ago.

Zoologists have traditionally recognised two primary branches of the marsupial family tree, dividing neatly between the Americas and Australasia. The didelphids, named after the North American opossum Didelphis, underwent extensive evolutionary radiation in South America, and are thought to have reached North America via the Isthmus of Panama some 15 million years ago when continental drift brought the two continents into contact.

The remainder of the world's marsupials are classified as australodelphids. Their evolutionary radiation occurred in Australia and New Guinea, although a few species later reached the fringes of South-east Asia, when continental drift brought the Australasian land mass into contact with the Indonesian archipelago.

Fred Szalay's observation violated this neat scheme. If he was right, Dromiciops was an australodelphid – or more logically, shared a common ancestor with the marsupials of Australasia. Given that Dromiciops seemed little-changed from the primitive microbiotheriids, the first marsupial to colonise Australia was probably a microbiotherid resembling Dromiciops.

Although Australia and South America were once part of the prehistoric supercontinent of Gondwana, they were separated by the breadth of an unborn continent even larger than Australia – Antarctica. When Australia and Antarctica began to part company some 30 million years ago, South America had already broken free and drifted northwards.

The fossil record left by the microbiotheriids, and the anatomical evidence of modern marsupials, indicate that the first marsupials evolved somewhere in the region of Gondwana that became South America – or possibly in Antarctica – and made their way overland to colonise the region that became Australia.

Peter Temple-Smith is a specialist in the area of reproductive biology, specifically in the biology of sperm. His continuing research at Monash involves the contributing factors and surgical treatment of male infertility.

In 1982, when he attended Fred Szalay's seminar, he was aware of a very basic difference between the sperm of American and Australasian marsupials.

Dromiciops: a marsupial missing link?

In American marsupials, sperm are formed singly in the testes, but then pair up upon entering the reproductive tract. The heads of the sperm are asymmetrical, being flattened on one side to produce a close fit when they pair up. The importance of this odd trait in reproduction remains unclear, since only a single sperm can fertilise an egg.

Australian marsupial males do not have paired sperm, and are more symmetrical. "If somebody came to me with a sample of marsupial sperm, I could tell very quickly whether it came from an American or Australasian species," Dr Temple-Smith said. "Sperm form pairs in all American species, while the Australian species have unpaired sperm. It's a striking dichotomy."

Dr Temple-Smith became intrigued to know whether Dromiciops fitted the Australasian or the American pattern. But testicular tissue from Dromiciops did not seem to be available, even from South America.

Finally he tracked down a formalin-fixed adult male at the University of Michigan, and managed to recover sperm from the scrotal region and fix it in wax, so that it could be sliced into thin sections on a microtome. But microscopic analysis of the specimen proved inconclusive.

"I knew that if the fixation procedure is not done carefully, the chemicals can cause the sperm to separate," he said. "The Dromiciops sperm did not seem to be paired, but there was no way of telling if this was the natural state.

"But under the electron microscope, the head of the sperm seemed to be symmetrical, in the Australasian form, rather than asymmetrical."

The only way to resolve the question was to go to South America and capture a Dromiciops male in breeding condition. In 1983 Dr Temple-Smith flew to Chile and, with the help of Araucarian Indian guides who knew the flora and fauna intimately, went into Chile's temperate rainforests in search of *monito del monte*.

"I was pretty fired up, but they were hard to catch," he said. "They don't come to traps easily. We didn't know when to catch them in breeding condition, but we went for six weeks in August and September on a false assumption that males should then be getting towards peak of their reproductive cycle, ready for mating in late September or early October.

"We got one adult male whose testes were just beginning to generate sperm, but there was no sperm in the reproductive tract, where they pair up in American species. It was an interesting six weeks, but we didn't get good information."

But during his visit, Dr Temple-Smith was struck by the resemblance of the Chilean rainforest to temperate rainforest in Australia. Araucarian conifers resembling those in north-eastern Australia's sub-tropical rainforests mingle with temperate elements including the Chilean firebush; Embothrium, a close relative of Telopea; and Lomatia, a genus that also occurs in Australia.

Other shared genera include the leatherwoods (Eucryphia spp), mountain pepper (Drimys spp) and the southern beeches (Nothofagus spp), mixed with huge Fuchsia trees – a genus absent from Australia's floras, but present in New Zealand.

On Chiloe Island, south of the seaport of Valdiva, Dr Temple-Smith could almost have believed he was in Tasmania. Dromiciops clambers around in the foliage of ancient Gondwanic plants, and leads an omnivorous life, dining on insects, purple Fuchsia fruits and, on the evidence of its specialised tongue, may also sip high-energy nectar from flowers.

Tasmania and Chile lie at similar latitudes, and their temperate forests both see frequent snow in winter. Dromiciops waxes fat in the warmer part of year, and hibernates during winter.

Dr Temple-Smith attaches special significance to the fact that Dromiciops is arboreal, omnivorous and a hibernator. "Whatever marsupial came through the Antarctic forests to reach Australia was probably an omnivore, rather than a specialist, because it had to be able to make use of different foods at different times of year. And it had to hibernate.

"Even though Antarctica had a temperate climate 40 million years ago, it would still have been very cold and dark during winter, because of the deep southerly latitudes."

Dr Temple-Smith made a second pilgrimage to Chile and Argentina in 1986. This time he was able to capture a male in breeding condition, and fixed some reproductive tract tissue containing sperm while in the field – a difficult but ultimately successful feat.

Continued on Research Monash 4

Riddle of the polar dinosaurs

For the past decade, Dr Pat Vickers-Rich and an army of volunteers have been excavating the hard rock of Dinosaur Cove. They have pieced together a picture of life in the region more than 100 million years ago.

"Why migrate a thousand kilometres north just for an extra hour of sunlight a day? My suspicion is that they remained active throughout the winter. There would have been plenty of food and probably they did very well." Pat Vickers-Rich is speaking about her favourite subject, dinosaurs, and perhaps the most provocative hypothesis in palaeontology today. Were some dinosaurs warm-blooded?

A decade of effort excavating the hard rock strata of Dinosaur Cove, east of Apollo Bay, has yielded just 5000 fossilised bones of animals that lived in the Cretaceous Period, between 125 million and 106 million years ago.

Between Dinosaur Cove, where the Otways dip into Bass Strait, and the Strzelecki Ranges of south-west Gippsland, Dr Vickers-Rich and her husband Tom, of the Museum of Victoria, have uncovered an extraordinary story of life at polar latitudes in the early to mid-Cretaceous.

During the first half of the Cretaceous, much of the planet sweltered in a tropical climate warmer than at any time since the first creatures left the oceans some 500 million years ago, or at any time since. But at 80 degrees south, less than 1500 kilometres from the South Pole, the mean annual temperature was no more than 5°C, and quite possibly much lower.

This was the latitude at which the animals of Dinosaur Cove flourished, in a broad, swampy valley dissected by braided and meandering streams, amid cool temperate forests of araucarian conifers, podocarps, gingkoes, ferns and primitive flowering plants.

Australia and its sister continent of Antarctica were conjoined, forming the south-eastern and southernmost regions of the prehistoric supercontinent of Gondwana. The Antarctic night was five months long, and for much of this time the forests would have been unable to photosynthesise.

The winter was as bitter as any experienced in modern Tasmania. It snowed, and low temperatures caused the streams to freeze over.

Yet the evidence from Dinosaur Cove is that groups of tiny plant-eating hypsilophodont dinosaurs continued to forage for at least part of this time. They were hunted by dwarf species of meat-eating theropod dinosaurs, including a small species of *Allosaurus* about three metres tall.

Cretaceous dinosaur fossils from China and Canada have led palaeontologists to speculate that herds of large plant-eating dinosaurs migrated southwards from polar latitudes to escape the winter, and that big predators like six-metre *Allosaurus* followed them.

If the big Arctic dinosaurs migrated, there is nothing to suggest their small Antarctic-Australian counterparts did the same, and there are intriguing hints that they remained active. In 1987 Dinosaur Cove Victoria produced a unique prize: the fossilised skull of a bantam-sized hypsilophodont. It had remarkably large optic cavities and a braincase that revealed correspondingly large optic lobes.

"This is very nice for an animal adapted to spending a lot of its time in semi-darkness," Dr Vickers-Rich said. "It's circumstantial evidence, but it's very interesting to find an animal with just the characteristics one would expect in something that lived year-round at very high latitudes."

The Riches named the new species *Laellynasauras*, after their daughter Leaellyn, a long-time member of their Dinosaur Cove expeditions. Apart from *Laellynasauras* adaptation to low light, its most interesting feature – in common with the other hypsilophodonts found at Dinosaur Cove – is its size.

Research assistant Ms Lesley Kool, holding a bone from the pelvis of a carnivorous dinosaur found at Dinosaur Cove.

Dr Pat Vickers-Rich holds a cast of a hypsilophodont skeleton, related to species found at Dinosaur Cove.

The design of all animals, ancient and modern, is constrained by a basic law of physics. The smaller the animal, the greater its surface area in relation to its volume, and the more rapidly it loses heat. Big bodies conserve heat: only large size and superb insulation allows the 1.2 metre emperor penguin to survive at comparable latitudes today.

The Riches say the Australian dinosaurs could have survived the winter by migrating, hibernating or remaining active. Their small size and the distances required to reach a milder climate argue against migrating.

They may have hibernated by burrowing into the soil and allowing their body temperature to drop to freezing or below during the coldest part of winter, but the nocturnal adaptation of *Laellynasauras* hints that at least some species remained active throughout winter.

For a small animal to stay active in sub-zero temperatures demands a high metabolic rate. The remarkable inference is that *Laellynasauras* and the other polar dinosaurs found at Dinosaur Cove were warm-blooded. A further piece of evidence that the dinosaurs did not migrate north is the presence of many fossilised bones of juveniles, suggesting that the adults were hatching and rearing their young at deep southerly latitudes.

Dr Vickers-Rich suspects they may have used the long, balmy polar summer days to build up fat that insulated them and provided an energy reserve in winter. Herbivores abroad in the dark, snowy forests would probably still have found plenty to eat. Some vegetation was probably not deciduous, and the organic matter from deciduous trees could have been processed as leaf litter. Where there are herbivores, meat-eaters are rarely far away.

The animals and plants of Dinosaur Cove – and the somewhat older Early Cretaceous flora and fauna of the Strzelecki Ranges of south-west Gippsland, where the Monash-Museum of Victoria team is also working – offer unique glimpses of life at high southern latitudes during the early to mid-Cretaceous.

There can be little doubt that both sites were indeed inside the Antarctic Circle – palaeomagnetic studies on rocks taken at both sites confirm it. Oxygen isotope studies point to a mean annual temperature of less than 5°C, and possibly as low as –6°C.

Dr Vickers-Rich believes the climate may have been something like that of Tasmania's highlands: the invertebrate freshwater fauna resembled that found today in the cold lakes of this region.

When such polar dinosaurs existed, Australia was beginning a slow northward drift that would see it completely separate from Antarctica by the Early Oligocene, 38 million years ago. The low-lying land to the south would eventually become a seaway as the two continents rifted, but in the Early Cretaceous the dinosaurs of the Otways and Strzeleckis were living well inland.

Dinosaur Cove was on the floor of a broad flood plain that was probably seasonally flooded by meltwaters from the high ground around its rim.

Mr Andrew Constantine, who has been exploring the sedimentary history of the two areas to predict where new bone deposits may occur, says the Dinosaur Cove area was a muddy floodplain with many streams feeding into larger rivers.

During the highwater peak, swollen streams would burst their banks, sending floodwaters across the surface of the plain, scouring it of plant and animal remains and depositing them in sandy-bedded channels.

In the Strzelecki area the environment was somewhat different. Here the sediments are of volcanic origin, like the Otways, but they were washed down from the sides of fault scarps as the valley floor subsided. The bones are found in ancient alluvial fans spreading out from the base of such steep escarpments that fed into streams flowing down the axis of a rift valley.

The Strzelecki fauna is also unique, and very different from that found at Dinosaur Cove. The fauna is dominated by labyrinthodonts, huge carnivorous amphibians.

Elsewhere in the world, the age of amphibians ended with a mass-extinction event at the Triassic-Jurassic boundary, about 190 million years ago,

Continued on Research Monash 4

Dinosaur discoveries may change scientist's views

continued from Research Monash 3

clearing the stage for the age of dinosaurs. Some persisted until the end of the Jurassic 130 million years ago, but the Strzelecki area is unique in having a Cretaceous labyrinthodont fauna, which survived well beyond their time elsewhere.

Somehow the big amphibians hung on for 10 to 30 million years longer in southern Australia. Why? The Riches point to a notable absence from the Strzelecki fauna: crocodiles.

Crocodiles occupied the same ecological niche as the labyrinthodonts, and throughout most of the world had taken the place of the predatory amphibians by the beginning of the Cretaceous.

Global climate

Crocodile fossils occur at Dinosaur Cove, reflecting the warmer climate that prevailed some 15 million years later, when Australia had drifted to slightly warmer latitudes at around 75 degrees south, and the global climate was much warmer.

At 80 degrees south, and some 15 million years earlier, it may simply have been too cold for crocodiles.

Dinosaur Cove continues to produce exciting discoveries that may force scientists to change their views on dinosaur physiology and behaviour. In late 1989 Lesley Kool, whose task it is to extract the dinosaur bones from their rocky matrix, began work on a block of stone whose edges revealed the presence of many bones.

By the time she had chipped away a substantial part of the block with a miniature pneumatic drill, Lesley realised that the bones belonged to a single skeleton – a little hypsilophodontid dinosaur related to *Laellynasauras*.

By locating blocks that had originally been joined to the first, she eventually recovered almost an entire skeleton from the shoulders down. She suspects the upper part of the body may still lie in a rock pillar in the main tunnel at Dinosaur Cove, to be excavated in 1993.

Abnormal

The little hypsilophodont had an abnormal shin bone – it showed signs of having healed after a serious fracture. Such an injury should have proved fatal because it would have prevented the animal moving around to forage.

How did the animal survive? Nobody can be sure, but the Riches wonder if it may not have been fed or protected by other members of its species, which would imply that the species lived in groups and displayed social behaviour. Parents, for example, may have brought food back to the nest for their hatchlings, just as birds do today. Such behaviour may have extended to assisting injured adults.

Only last month the team found the femur of a small theropod. It is 44 centimetres long, the longest bone yet found at Dinosaur Cove. It belonged to a slender, meat-eating dinosaur, possibly an ornithomimid (bird-mimic). The bone is slender and hollow with quite thin walls.

The discovery may help to narrow down the identities of the theropod dinosaurs at Dinosaur Cove. So far the excavation has failed to produce any theropod teeth, even from toothed predators like *Allosaurus*.

The orni-thomimids not only had lightweight, bird-like skeletons, they also possessed beaks rather than teeth. They may have lived as scavengers, or by raiding the nests of species like *Laellynasauras* for eggs or young.

The Otway fauna has some unexpected vertebrates, too. Bones have been found of the long-necked aquatic predator, plesiosaurs.

Given the environmental setting, this may have been a marine species that swam upriver to hunt, or like the dolphins of the lower Ganges and the Amazon today, may have been adapted to a freshwater existence.

Oldest flower

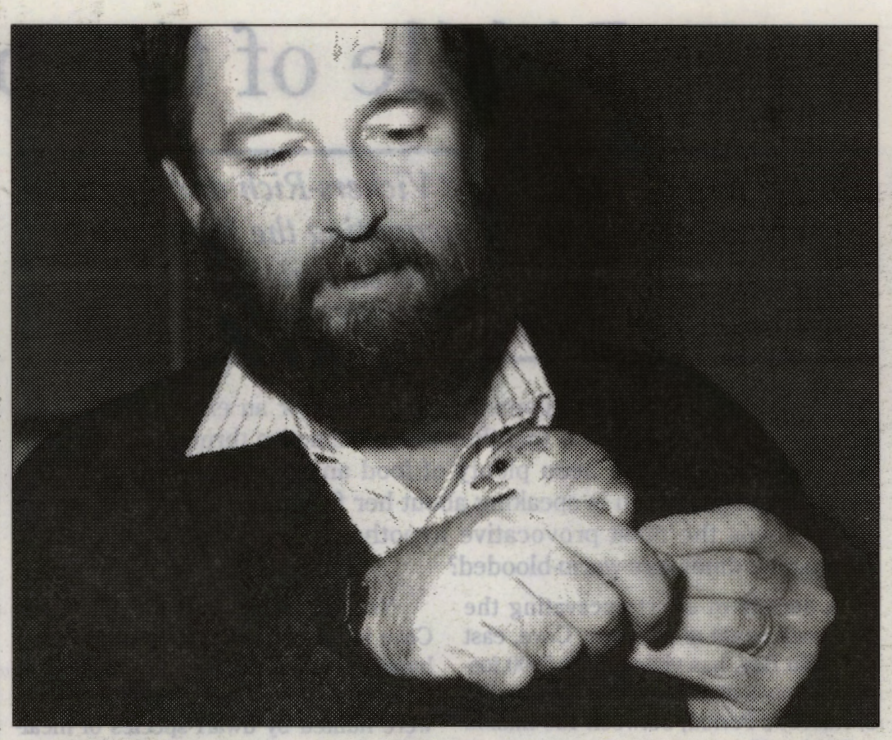
There were lungfish in the streams, and primitive turtles that had not yet evolved the kinds of retractable or foldable necks typical of modern species.

The Koonwarra deposit in the Strzeleckis, apart from providing a fossil of the oldest flower in the world, has also yielded six enigmatic feathers of unknown birds – not flightless ratites like emus and cassowaries, which have a long history in the southern continents, but species that were truly flying birds.

All of the excavation at Dinosaur Cove has been carried out by volunteers. Many have come through the Massachusetts-based Earthwatch group, and have actually paid for the privilege of excavating some of the toughest fossil-bearing sandstones and claystones anywhere in the world.

Primary funding has come from the Australian Research Council and the National Geographic Society, augmented by donations of money and supplies from private industry.

The main industry supporters are the Swedish mining equipment company Atlas Copco, Shell, Mobil, ICI and Ingersoll Rand, while the Coles, Safeway and David Holdings grocery groups have provided much of the food and other provisions.



Dr Peter Temple-Smith with Sminthopsis, an Australian native marsupial similar to Dromiciops.

The marsupial family tree

continued from Research Monash 2

Back in Australia, an electron microscope made it clear that sperm released into the reproductive ducts remain unpaired, in the Australasian manner. Now there could be little doubt that Dromiciops was an australodelphid.

The definitive piece of evidence came last January when noted marsupial biologist Dr John Kirsch, who has made important contributions to marsupial taxonomy in Australia, sent Dr Temple-Smith a fax from the University of Madison in Wisconsin.

Dr Kirsch was among the many biologists who were initially sceptical about Fred Szalay's hypothesis that Dromiciops was an australodelphid. Dr Kirsch himself had advanced a controversial theory in the early 1980s that suggested the original direction of colonisation had been in the opposite direction, from Australia to South America, but like most biologists, suggested that the ancestral marsupial was a specialist carnivore or insectivore.

Marsupial taxonomists in Australia believe that the dasuryids, the family that embraces species like the native cat, Tasmanian devil, and smaller predators like Antechinus and Sminthopsis, are the most primitive of Australia's marsupials, and closest to their presumptive ancestor.

Dr Kirsch decided to use the very latest techniques of molecular biology to resolve the identity of Dromiciops. He used a technique called DNA hybridisation, which gained acceptance in the 1980s as a powerful adjunct to more traditional techniques of physical taxonomy. DNA hybridisation exploits the fact that species diverging from a common ancestor steadily accumulate mutations in their DNA.

The double-stranded DNA of the two species to be compared is heated to around the boiling point of water, causing it to separate into two single strands. The single-stranded DNA is now mixed and allowed to cool, forming a hybrid molecule – a helix comprising the complementary strands of the two species.

Wherever mutations have occurred, the DNA fails to match up, weakening the bonds that normally hold the helix together. The hybrid molecule is then reheated. Because its bonding is weakened by mutational mismatches, it separates at a lower temperature (less than 100°C), proportional to the evolutionary time that separates the two species.

The fax that Dr Temple-Smith received in January contained news of the results of Dr Kirsch's experiments in hybridising Dromiciops DNA with that of Australian and American marsupial species. The closest match was with DNA of phalangerids – Australia's possums – just as presaged by Fred Szalay in 1983.

That creates problems for taxonomists. "The carnivorous dasyurids have always been regarded as more primitive than the macropods and phalangerids, and for this reason, people have tended to regard the dasyurids as being closer than other Australian marsupials to Dromiciops.

"But Kirsch's finding implies, like the sperm data, that Dromiciops is more closely related to the phalangerids with the dasyurids branching off at an early stage from the Australian marsupial evolutionary tree," Dr Temple-Smith said.

"It will be interesting to see how marsupial evolutionists will now use the information to reinterpret the origins of Australian marsupials."

Interferons fight cancer and virus diseases

continued from Research Monash 1

Some of the eight melanoma cell lines did not respond to single interferons; others showed some response.

But it was the combination treatment that provided the most dramatic results: the cells rapidly died.

Recently the Monash team extended its experiments to a special strain of mouse that can accept grafted human cancer cells. The first tumour studied responded positively to the same interferon treatment that had worked so effectively in test tube cultured cells, and further detailed studies of this tumour are in progress.

Tumours derived from the other melanoma cell lines will be subjected to similar experiments. Professor Linnane expects that they will respond to different combinations of interferons.

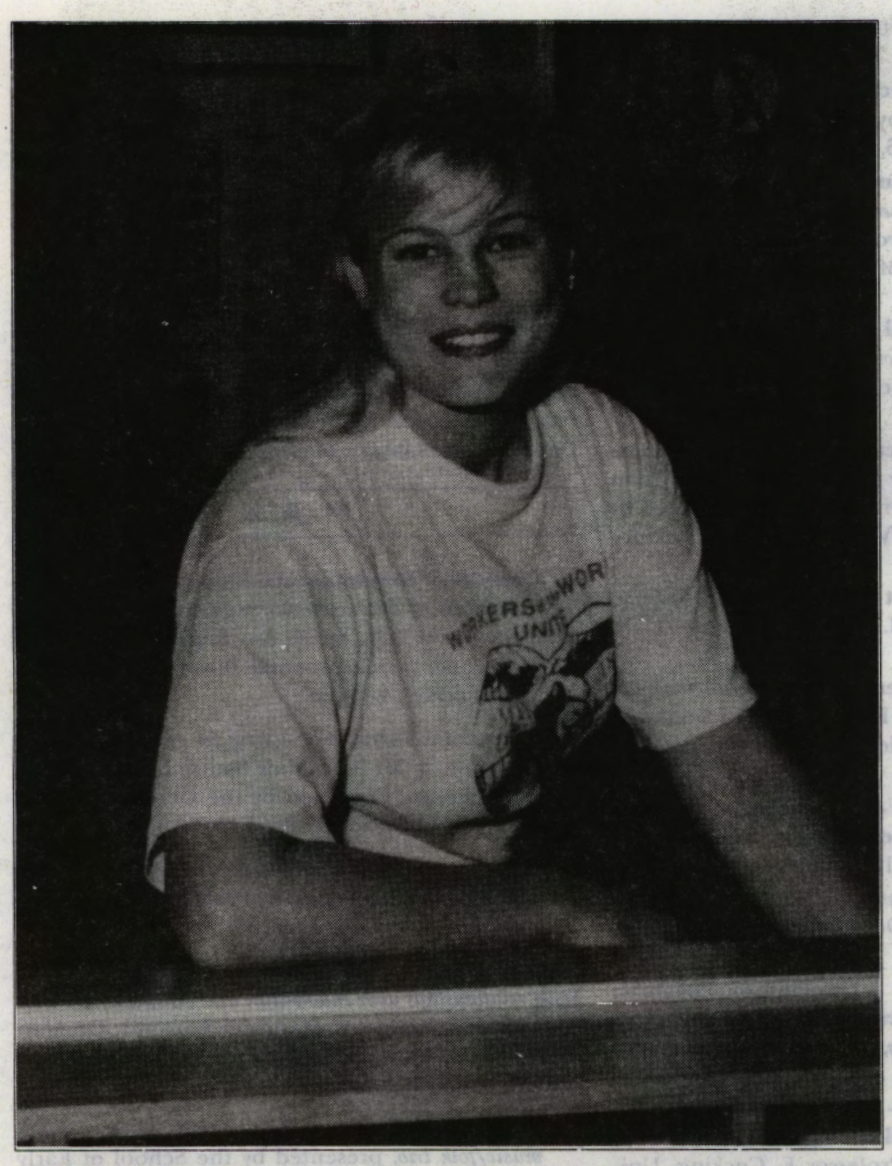
The pronounced regression of the melanoma tumour in the first mouse experiment has provided evidence that the Monash researchers are on the right track.

Another experiment has provided an insight into the cellular mechanisms involved.

Professor Linnane and his senior colleagues have shown that the different interferons induce the cells to produce new proteins.

Interferons are known to act through cell-surface receptors, which activate genes in the cell nucleus.

"If we can determine which combinations of interferons work best, we believe we can enhance our success even further. Our results are very promising for the treatment of human melanoma," he said.



Chairperson of the Monash Association of Students, Ms Kerren Clark.

Challenging agenda for new MAS leader

An academic skills course, fairer appeal procedures, more support for overseas students, a campus dental service and reform of the student loans scheme all are on this year's MAS agenda.

It points to a full year for newly-elected Chairperson of the Monash Association of Students, Ms Kerren Clark.

Ms Clark, in her third year of a Bachelor of Science in physiology, says she is excited about her new role, but realises that there will be problems dealing with a group that is so large and diverse.

"MAS is attempting to cater for the needs of every student – this is not an easy task," she said.

Cooperation

Ms Clark believes the approach and attitude of MAS has changed over the years.

"In the past the trend has been to oppose the decisions of administration. Although we still don't agree with all of their actions and policies, we now work together on many issues and there is a lot more cooperation," she said.

She said the services provided by MAS – ranging from student employment and welfare to activities, car pooling, arts and crafts and public affairs – were now more sophisticated.

MAS would be focusing on a diverse range of issues this year. One of the foremost is the development of an academic skills unit next semester.

"We feel that all types of students, whether they have come straight from school or are mature age, should be given the opportunity to practice academic skills such as effective studying, essay writing and exam preparation," Ms Clark said. "At the moment this need is not being met."

Another project, which ties in with the academic skills unit, is to work with the Centre for International Students to improve the support given to overseas students.

MAS also is involved in changing the process of administrative appeals. The association wants to establish a fair appeals approach for all students, regardless of faculty.

"There is a need for the general appeals process to be improved if a student is unhappy, for example, about marks, lecturers or administrative errors. There needs to be some sort of alternate grievance procedure," Ms Clark said.

She believes that the current system is ad hoc and that students should have access to a formal system.

Dental service

Other issues include establishing a dental service on campus and reforming the student loans system.

Ms Clark has an interest in working with students with disabilities. MAS has organised an easy access room in the Union Building and also is trying to improve library access.

She also is working with HEARU on a project to examine the standard of teaching.

"It is very enriching to work with these people and to find that academics, as well as students, are concerned with maintaining standards," she said.

She has been involved with MAS for the past three years. When she has completed her year as chairperson she hopes to complete an honours degree.

Car pooling to ease parking congestion

Staff and students are being urged to find new ways to cover their well-beaten tracks to and from Monash campuses.

Monash Association of Students transport officer, Mr Jim Black, believes that many more Monash people could find alternative means of transport.

"We want Monash people to take up the challenge and try cycling or catching public transport. If you must come by car, you should share," he said.

He said that 90 per cent of cars on the Clayton campus still carried only a driver.

The MAS car pool service was helping to change people's transport habits by matching those with transport to those wanting lifts. The university is looking at developing the service by offering some good parking spaces to car sharers.

"The potential for change is enormous. Parking problems could be eased significantly if only more of these cars brought a passenger.

"More than a third of the university population sets off for campus every day from within the Oakleigh, Waverley and Caulfield districts.

"Many people live close enough to commute by bike. We have to do everything we can go give them the confidence to start riding."

Mr Black said the association was developing information on public transport services and cycling routes, some of which will be published in forthcoming editions of *Montage*.

"What people need most is to be provided with clear information on what transport choices are available," he said. "This must be supported by an upgrading of bicycle and bus facilities – on campus and beyond."

Computer publishing arrives

Some of Monash's publications are going electronic. Two of its regular newsletters – *Etcetera* and *VC's Desk* – are now converted to the international 'Usenet' computer network format and made available through the university's computer network via the newsgroup 'monash.general'.

These publications will be available about two days earlier than the printed version.

In addition, the university's handbooks are to be made available on the network, allowing access to careers advisers and prospective students.

"As computer access becomes more common, this will cut down the number of handbooks which need to be printed," said Manager of Publishing and Advertising, Mr John Wilkins.

A new publication, *Courses at Monash*, will eventually become the basis for a 'HyperCard' stack for Macintosh computers.

Its predecessor, *HyperCourse*, a Chisholm Institute database programmed by Publications Officer Mr Tim Mansour, was distributed to secondary schools, libraries, companies and universities.

'HyperCard' is a graphical computer system allowing users to navigate through large amounts of information by selecting text or pictures on the screen with a mouse.

The Chisholm version included maps of the campuses and public transport, general information, and subject and course descriptions.

Mr Wilkins said he would investigate this burgeoning field during a study tour in North America later this year. He will be examining the feasibility of publishing university information on CD-ROM discs.

"Their use is becoming more widespread, and they are relatively cheap to manufacture compared with printing costs," he said.

"Another use of computer publishing we are considering is putting the university's *Research Report* on computer disk to include in a new magazine-style research publication. The disk would be accessed by the recipient's word processor software.

"This would be especially useful for academics and journalists, who can search for the particular information that interests them.

"By including a complete list of the research interests of each department, it would also be useful for graduate students wanting to do research."

For more information, contact Mr Wilkins on extn 73 2099.

Diary

APRIL

9–13 **Season 91 Alexander Theatre** *Sisters*, by Stephen Sewell. A production from Playbox Theatre Centre.

11 **Holocaust Commemoration Service**, keynote address by Professor Anderson Mabd. Robert Blackwood Hall. 1 pm. Admission free.

Preserve Planet Eartn Seminar, by Dr Graeme Pearman, global warming and Dr Dean Graetz, land degradation. Hosted by The Rotary Club of Waverley. Robert Blackwood Hall. 7.30 pm.

Ecology & Evolutionary Biology Seminar *Agrobacteria and genetic manipulation of secondary metabolism in plants*, by Professor John Hammil. S8. 1 pm.

Southeast Asian Studies Seminar *Recent investment from the East Asian NICs into Indonesia*, by Dr Thee Kian Wee, Research Fellow, RSPacS, ANU. Room 515, Menzies Building. 11.15 am.

Science Education Seminar *Teaching technology in science 5–8*, by Dr Cliff Malcolm, John Gardiner Centre. Faculty of Education, Room 324. 1 pm.

12 **Jazz at the Club** *Bob Sedergreen.* University Club, Clayton campus. 8.30 pm.

Accounting & Finance Seminar *Pricing of SPI future options with daily marking to market*, by Dr Garry Twite, Australian Graduate School of Management. Room 954, Menzies Building. 2.15 pm.

15 **English Seminar** *Burlington's library at Chiswick*, by Dr Phil Ayres. Departmental library, Menzies Building. 12.10 pm.

Lunchtime Concert *Traditional music and dance from Central Java*, presented by the Monash Gamelan Orchestra. Performed by the students of the Monash Music Department. Directed by Poedijono. Robert Blackwood Hall. 1.15 pm.

16 **Classical Studies Lecture** *Thucydides, Brasidas, Cleon and Torone*, by Professor Alan Henry. Rotunda Lecture Theatre 6. 8 pm.

17 **Environmental Forum** *The sex gene, human disease and genetic engineering*, by Associate Professor Jennifer Graves, La Trobe University. Presented by the Graduate School of Environmental Science. R6. 5.15–6.30 pm.

Genetics & Developmental Biology Seminar *Improvements of pod set in the lupin crop, Lupnus anqustifolius L*, by Dr Alix Pigeaire, Calgene Pacific. Room 662, Biology Building. 4.15 pm.

18 **Classical Studies Lecture** *The 1991 Excavations at Ancient Kellis in the Dakhleh Oasis*, by Dr Colin Hope, Dr R. Jenkins and Dr Olaf Kaper. Presented by the Egyptology Society of Victoria. Rotunda Lecture Theatre 6. 7.30 pm.

Inaugural Evening Concert *Australian Wind Sinfonia*, conductor – Barry Bignell. Robert Blackwood Hall. 8 pm.

Southeast Asian Studies Seminar *Indonesian responses to the gulf crisis*, by Dr Herb Fieth, Centre of Southeast Asian studies. Room 515, Menzies Building. 11.15 am.

22 **English Seminar** *'The True Father of His Children': Gender, Exchange and (Re)Production in Ben Johnson's 'Volpone'*, by Dr Denise Cuthbert. Departmental Library, Menzies Building. 12.10 pm.

Lunchtime Concert *Wolfgang and Nannerl*, featuring Elizabeth Anderson and Douglas Lawrence. Robert Blackwood Hall. 1.15 pm.

24 **Literature Seminar – Uncommon Pursuits: Inside/Outside Literature** *Women, popular culture and the question of agency*, by Professor Lesley Johnson, University of Western Sydney. Room 809, Menzies Building. 3.15–5.15 pm.

Genetics & Developmental Biology Seminar *Genetic manipulation of cereals*, by Professor E. Cocking, University of Nottingham. Room 662, Biology Building. 4.15 pm.

Environmental Forum *Bringing intercultural perspectives into the legal process*, by Ms Greta Bird, Director of the Centre for Cross cultural studies. R6. 5.15–6.30 pm.

Chemical Lecture (combined RSC, MCS, RACI lecture) *New dimensions in indole chemistry*, by Professor D. St C. Black, University of New South Wales. S2. 4 pm.

26 **Lunchtime Concert** *Music and letters of Mozart*, by Greg Hurworth, Ros Smith and Joe Dora. Presented by the School of Early Childhood and Primary Education. George Jenkins Theatre, Frankston campus. 1.15 pm.

29 **Lunchtime Concert**, by John O'Donnell. Includes works by Frescobaldi, Purcell and J.S. Bach. Robert Blackwood Hall. 1.15 pm.

English Seminar *'A foolish Faune indeed': A psychology of Pan in the English Renaissance*, by Dr Mark Allinson. Departmental Library, Menzies Building. 12.10 pm.

MAY

1 **Genetics & Developmental Biology Seminar** *Genetic analysis of the facultative methylotroph, methylobacterium extorquens AMI*, by Ms Kin Eng, Department of Genetics and Developmental Biology. Room 662, Biology Building. 4.15 pm.

Environmental Forum *Consulting for corporate environmental audits*, by Mr John Muir Smith, Environmental Advisory Service. Presented by the Graduate School of Environmental Science. R6. 5.15–6.30 pm.

2 **Ecology and Evolutionary Biology Seminar** *Sex allocation in social insects*, by Professor Ros Crozier, La Trobe University. S8. 1 pm.

Southeast Asian Studies Seminar *Institutional Links: Sister relationships with Indonesian universities*, by Dr Barbara Hatley, Professor Margaret Kartomi, Dr Alan Rice and Professor Bill Rachinger. Room 515, Menzies Building. 11.15 am.

3 **Lunchtime Concert** *The Weird Sisters: Early music/folk trio*, presented by the School of Early Childhood and Primary Education. George Jenkins Theatre, Frankston campus. 1.15 pm.

6 **English Seminar** *Scott, story-telling and subversion: Dialogism in 'Woodstock'*, by Dr Chris Worth. Departmental Library, Menzies Building. 12.10 pm.

Scholarships and fellowships

Asian Languages Scholarships

The Asian Studies Council is offering 70 scholarships to encourage studies in Asia during 1992. The National Asian Language Scholarship Scheme (NALSS) offers 50 scholarships to language teachers undertaking advanced study.

For further information, contact the Scholarships Secretary, DEET, PO Box 9880, Canberra 2601. Telephone (06) 276 7532. 30 June.

Corpus Christi Visiting Fellowships

The Corpus Christi College University of Cambridge is offering one year's accommodation for scholars with several years of academic experience.

For further information, contact Ms Stella Smith, College secretary, Corpus Christi College, Cambridge CB2 1RH, UK, phone 0223 338023 and fax 0223 338061. 1 October.

Harold White Fellowship

The National Library of Australia, through the Harold White Fellowship, provides access to its collection for scholars, librarians and writers.

For further information, contact Mr Graeme Powell, National Library of Australia, Canberra ACT 2600. 30 April.

Rotary Overseas Study

The Rotary Foundation Scholarships are tenable at the overseas institution of the applicant's choice.

For further information, contact Mr Fred Griffiths, telephone 870 7684. 19 April.

National Heart Foundation Awards

The National Heart Foundation of Australia offers financial assistance for research undertaken in cardiovascular and related fields. For further information, contact the Research Manager, National Heart Foundation of Australia, PO Box 2, Woden, ACT 2606.

Applications should be lodged by 31 May, except for the Postgraduate Science Research Scholarships, which should be lodged by 31 October.

AFUWs Scholarships

The Queensland Branch of the Australian Federation of University Women (AFUW) is offering two fellowships for women graduates from a recognised institution in any country. The fellowships are tenable in Australia. The **Freda Bage Fellowship** is for postgraduate research. The **Commemorative Fellowship** is for postgraduate study.

Application forms may be obtained from the Administrator, AFUW-QLD Fellowships, PO Box 586, Kenmore, QLD 4069. 30 September.

Nuffield Foundation Fellowships

The Nuffield Foundation, administered by the Commonwealth Institute, is offering fellowships to candidates who are working in education.

For further information, contact Sandra Lucas, Program Coordinator, Commonwealth Institute, Kensington High Street, London W8 6NQ, UK. 15 September.

Research grants

Australian Electricity Supply Industry Research Board

AESIRB has called for expressions of interest to conduct greenhouse research related to the electricity supply industry in Australia. 12 April.

Further details, application forms and guidelines may be obtained from the Office for Research, extn 75 3085 or 75 3012. Applications must be lodged by the date specified.

For rent

Forest Hill, 20 Romoly Drive
(Melway 62C5)
$155 PW. 3 bedroom home freshly painted, new carpet, lounge, kitchen with meals area, huge double LU garage, large covered patio. Quiet location, walking distance to all facilities. Available immediately. Telephone: 561 8951.

Doncaster East, Moor Park Crest
(Melway 34F7)
$205 PW. Spacious 4 bedroom home comprising master bedroom with BIR and ensuite, large lounge-dining, modern kitchen with dishwasher, gas ducted heating, large family room, shed and large backyard, drapes and ww carpet. Telephone 561 8951.

Victorian terrace house in Hawthorn
Recently renovated, fully furnished house available between 1 July 1991 and 31 January 1992. Three bedrooms, one bathroom, fully appointed open plan kitchen, family room, lounge room with open fireplace, laundry with full facilities, additional indoor WC, carport and rear access, gas heating, linen and crockery provided. Contact Sally Batten or Greg Tucker on 818 6103 or extn 73 2588.

Room to rent in Elwood
Professional 30 year old seeking young person to rent upper level of house in Elwood. $50 per week. Lovely area, close to sea. Telephone 596 6225 (ah), 640 3567 (bh).

Rooms available
The Halls of Residence, situated at the north east corner of the Clayton campus, has some vacancies. The accommodation fee of $72.10 per week provides students with a fully furnished, heated and carpeted bedroom as well as linen change weekly, the use of TVs, videos, computers, billiard tables, table tennis tables, newspapers and laundry facilities. There are no further costs for heating, lighting or other essential services – these are provided as part of the accommodation fee. All meals are available at subsidised prices in the halls' dining rooms on a cash basis.

Further information and application forms may be obtained from the Halls Admissions Office, extn 75 3930.

Picture: HERALD-SUN

Pictured at the launch of the 1991 Monash theatre subscription season are (clockwise, from top left) Manager of the Alexander Theatre, Mr Phil A'Vard; the Victoria State Opera's Mr Rob Robertson; Playbox Theatre's Ms Jill Smith; and Vice-Chancellor, Professor Mal Logan.

Theatre seasons open at Clayton and Frankston

The 1991 Monash University theatre subscription seasons have been launched officially by Vice-Chancellor, Professor Mal Logan.

The Monash season of professional theatre is now in its third year at the Alexander Theatre, Clayton campus.

This year, for the first time, a subscription season of professional theatre will be presented at the George Jenkins Theatre on the Frankston campus.

The Alexander Theatre's program includes four plays and an opera. Three plays will be presented at the George Jenkins Theatre.

At the first subscription season in 1989, three plays were presented in a three week season. The season was an outstanding success, and last year it was extended to five productions over nine weeks.

As well as Playbox and other producers, the Victoria State Opera is again involved, making the season one of the most diverse in the country.

The first production at Clayton, Stephen Sewell's *Sisters*, will be followed by *Alive and Kicking* in May, *Wallflowering* in July, and *The Adman* in August. The Victoria State Opera's *Cosi fan Tutte* will show in June. *Alive and Kicking, Wallflowering* and *The Adman* will show at Frankston during June and August.

"It is important for the university to be a part of its surrounding community," Professor Logan said at the official opening. "The Alexander Theatre achieved this aim last year with over 120,000 people passing through its doors. Since 1989, we have firmly established that there is a strong demand for quality professional theatre in the south-eastern suburbs.

"The Monash theatre season gives patrons convenience in travelling time and parking. In one subscription package, they are offered a year's worth of theatre entertainment that represents everything that they could see in the city."

With three plays presented over three weeks, the season at the George Jenkins Theatre will provide residents of Frankston and the Mornington Peninsula area with access to quality professional theatre, previously only seen in metropolitan Melbourne.

"In the longer term, we hope to work with the Frankston community to develop the George Jenkins into a superbly equipped cultural entertainment centre which would benefit the whole community," Professor Logan said.

The Alexander Theatre also will present a program of children's theatre. As well as regular school holiday presentations throughout the year, the theatre will have special showings for school groups during terms.

The long-running subscription series for children, The Saturday Club, again will provide quality entertainment aimed at introducing young people to theatre.

Book reviews

Parks and gardens explored

Any idea how many plant species are represented in the Royal Botanic Gardens? What about the number of bridges across the Yarra River, or where to find an albino kookaburra?

The answers to these questions, and a wealth of other information, are contained in *A Guide to Melbourne's Parks and Gardens.*

Written by Monash graduate Rhonda Boyle, it contains information and history about 170 open spaces throughout the Garden State.

The book covers parks and gardens from the You Yangs and Werribee, to the plains and hills west and north of the city, the Dandenongs and Mornington Peninsula, as well as central Melbourne and suburbs. It includes gardens of historic homes and amusement parks.

Each entry provides information on getting there, basic facilities, opening hours and admission charges. Details of things to do and see, and facilities such as picnic tables, toilets, playgrounds and tea rooms are included.

The author completed a masters degree in environmental science at Monash in 1975, and has worked as an environmental planner for the State government for the past 15 years.

She prepared the Metropolitan Open Space Plan 1988, the first review of the city's open spaces since 1929. A keen walker, nature lover and photographer, her knowledge of Melbourne's recreational areas is extensive.

The 288-page book, illustrated with maps and cartoons, is available at Monash bookshops or from the author, phone 598 5889 (ah), 615 4520 (bh), or fax 615 5648.

(Answers to questions: 10,000 plant species; 57 bridges; Healesville Sanctuary.)

German history in Australia

The history of Germans in Australia from 1838 to 1945 is the subject of a new book by Charles Meyer.

Mr Meyer, a lecturer in german studies and multicultural education in the School of Early Childhood and Primary Education at Frankston campus, examines the arrival and integration of Germans into Australia.

While South Australia is traditionally seen as the major area of early German settlement, *A Useful and Valuable Description of People* pays attention to those who settled in Victoria. German settlements in other states also are covered.

The book looks at the question of a culture maintaining its ethnic identity while integrating into mainstream society – an issue relevant to multicultural studies today.

The illustrated, 200-page book is available for $25 from the Centre for Continuing Education, Frankston campus, extn 74 4240.

Dina Panozza and Morna Seres star in Sisters, *described as an intense, moving drama of two sisters attempting to resolve past conflicts.*

Written and directed by acclaimed Australian playwright Stephen Sewell and produced by the Playbox Theatre Centre of Monash, Sisters *is playing at the Alexander Theatre until 13 April.*

It is the first production of the 1991 Monash theatre subscription season.

SAVANT

by Roger Short

ABORTION is like poverty. Nobody likes it, but it will always be with us. The intellectual debate about abortion, and the rights of the foetus to live versus those of the mother to choose whether it does so, have reached a stalemate. The views of the Pro Life and Pro Choice lobbies have become so entrenched that neither side is likely to convince the other of the justness of its cause.

But whilst we in developed countries are happy to continue debating the ethics and philosophy of the beginnings of human life, millions of women in developing countries are dying because of our inertia.

We have denied them the funding and the facilities to regulate the size of their families, thereby forcing them to put their very lives at risk by resorting to illegal abortions as a last desperate resort.

Is it not time that Tweedledum and Tweedledee came to their senses and made common cause to alleviate this intolerable suffering amongst the deprived women of the world?

Contraception and abortion are inextricably related to one another. Failure to provide the former results inevitably in an increase in the latter. And it is here that I find people's attitudes so hypocritical. Surely prevention is better than cure?

Yet if we look at the teenage pregnancy rate and the teenage abortion rate in the United States today, and compare it to that of Denmark or the Netherlands, we see a striking contrast.

The US has one of the highest teenage pregnancy rates of any developed country, and in 1988 there were 860,000 pregnancies, of which 397,000 ended in induced abortion.

But in marked contrast to this, Denmark and the Netherlands, where teenagers commence sexual activity at a comparable age to those in the US, have a much lower pregnancy rate, and far fewer abortions as a consequence. The explanation is obvious enough.

Denmark and the Netherlands have excellent sex education programs in schools and family planning facilities, something that the inappropriately named Moral Majority and others of that ilk implacably oppose in the US.

Indeed, if you plot the religiosity index of a country against its teenage pregnancy rate, you find a *positive* correlation; the more religious the community, the more teenage pregnancies there are! The moral is obvious.

National attitudes to abortion are closely related to socioeconomic development and concepts of sexual equality. Education is one of the best motivations for restricting family size, since increased educational facilities transform children from being an economic asset into an economic burden.

One of the first ways in which a community in the early stages of socioeconomic development responds to the increasing need to regulate family size is by relying on abortion, which is almost inevitably illegal to begin with.

These abortions are therefore performed by unskilled lay abortionists in the most unhygienic surroundings, and many women pay for it with their lives.

Africa is a good case in point. Abortion is illegal throughout most of sub-Saharan Africa, and there is a poor provision of family planning services. With the increasing desire to restrict family size, there are enormous numbers of illegal abortions.

The lengths to which women will go in their desperation to terminate an unwanted pregnancy know no bounds. They may drink petrol, stick knitting needles or wire coat-hangers through the cervix, or submit to a massage abortion which kneads the embryo to a pulp.

Gradually the legal prohibitions on abortion will be relaxed, thus making possible the early termination of pregnancy by skilled medical staff using a modern procedure like vacuum aspiration of the uterine contents. This is a remarkably safe procedure in skilled hands. In the US it is 11 times safer than having your tonsils out or giving birth.

Once family planning services are made freely available, and abortion is legalised, there are rapid declines in the abortion rate. Good present-day examples of this are to be seen in countries like Denmark, France, Iceland, Italy and the Netherlands, where abortion is available on request as part of a comprehensive voluntary family planning service.

Since we are all probably united in our desire to see a decreased incidence of abortion, who could gainsay such an obvious solution? But abortion will never disappear completely.

No country has ever controlled its rate of population growth without some access to abortion, and there will always be a need for abortion services to compensate for contraceptive failures.

Recent events in eastern Europe have highlighted this abortion-to-contraception transition. Russia does not manufacture any of the modern forms of contraception such as pills or intrauterine devices; the only home-made products are very poor quality condoms that are disparagingly referred to as "galoshes".

Abortions are theoretically available on demand and are subsidised by the state, but administrative and bureaucratic barriers mean that many women will have a number of state abortions, topped up with a number of private, illegal ones. Apparently it is not uncommon for a Muscovite woman to end up with 16 or more abortions during her reproductive life.

Romania's Ceausescu had in place for 14 years an edict banning all abortions and all forms of contraception in a futile attempt to raise the birth rate. As a result, there was an enormous increase in the incidence of illegal abortions and attendant maternal mortality, and 30,000 children were abandoned at birth, to be reared in State orphanages.

Let this serve as a warning to any other nation that is thinking of outlawing abortion and contraception. It is chilling to realise that those in the US who are most outspoken in their opposition to abortion are often those who also oppose sex education in schools and the provision of contraceptive services.

It is difficult to know precisely how many abortions are performed each year around the world. It is probably about 50 million, of which almost half will be illegal. That works out at about one induced abortion for every two to three births.

It is men who universally dominate the politics of abortion, and frame the legal codes that result in the deaths of around 200,000 women a year from illegal abortion. Their deaths should be on the conscience of each and every one of us, because they could be so easily prevented.

But they are in another country so who cares? Meanwhile, let's return to the philosophical debate about Pro Life versus Pro Choice: it's so intellectually challenging, don't you think?

Professor Roger Short is Chairman of the Centre for Reproductive Biology.

DIOGENES

IT'S A VERY peculiar practice, the transmigration of souls between city and country. As one family puts a chainsaw through its last remaining taproot in the hinterland and points the ute in the direction of a smudge above and beyond the ranges, another in super-urbia is slamming a triple deadlocked front door for the last time – remembering suddenly the Flymo still hovering around the lemon tree – before lighting out for a distant puff of wood smoke on the horizon.

The traffic of goods and chattels between city and country has become increasingly heavy in recent years. The matter is beyond economics, it's more about expectations. But there can be hitches.

It happens like this. The city family one day realises it has tired of its ant farm existence, of collateral damage in the supermarket and grimy sunsets. The final straw comes when the brindle bitser is abducted by the Mooroolbark Liberation Front and held ransom for a photograph of an uncluttered and neonless skyline.

The family can no longer trade the substance for the shadow. So a deposit is placed on a bush block.

Someone attends classes in mud-brick making. Another learns how to make bread. Junior members are taught the finer points of country salutations, beginning with a raised eyebrow and slowly working up to weather talk.

A kit home is purchased and built, jobs are shucked, the move is made. Deep down they know they will never find Utopia, but figure that unbistrofied hotels, with their regulation number of stock country characters, will more than make up for the loss of public transport and extended shopping hours.

They celebrate their first weekend as country folk with a meal at the local. A family member asks an elderly bushie if he "would please refrain from smoking", quoting recent research figures on its effects on bystanders. A minor fracas ensues when the request is ignored. The publican later bans the entire household from ever darkening his doorway.

Meanwhile, in another heartland, a dispirited farming family remembers well their Christmas sojourns in the city. In frustration they write to friends there asking if jobs abound, if it is true that shops now remain open way past noon on Saturdays, that a convenience store stands on every street corner, that pubs now come in a range of pastel colours and sell rainbows of cocktails and exotic beer.

Before a reply is received the land is sold to a developer who for some time has been itching to practise a little subdivision.

The city looms larger in their lives. Children rehearse playground greetings, starting with "hey" and graduating to high fives. Their parents picture barbecues in the backyard, visits to restaurants, cinemas, and a life untrammelled by calving and drenching.

The first morning in brick veneer they light the gas barbecue, piling it high with logs of wood. Three hours later the pergola is no more than some blackened stumps set in cement.

The parents contemplate taking up smoking, purely for relaxation.